and equatorial. According to this theory, past variations in climate in any given place have been due to pendulation.

Glacial periods, such as the Permian and Pleistocene, have been developed through a poleward swing of regions now temperate; while warm periods, such as the Cretaceous and Eocene, have been developed by means of a swing toward the equator. At the present time Europe and eastern North America are supposed to be swinging southward and getting warmer, while western North America is swinging northward. Pendulation causes constant redistribution in the oceanic waters, by reason of the earth's oblateness, thus accounting for the submergence of coast lines.

The major portion of the volume is devoted to the presentation of the facts of distribution in animals as related to the pendulation theory. It is claimed that the various groups are more or less symmetrically distributed with reference to the fixed poles, owing to the control exerted on migration by the swinging of the earth on its axis of pendulation. One chapter only is given to plants, and in this chapter chief attention is paid to the conifers and Campanulaceae. Three maps are presented, showing the distribution of the conifers. In these and other maps southern Europe figures largely as a center of origin of forms and a center of migration, and the attempt is made to show that migration has taken place symmetrically from that region.

The volume as a whole has a strangely medieval atmosphere. Students of geographic distribution in these days are so accustomed to look carefully for facts that they have largely ceased to care for hypothetical disquisitions such as that of SIMROTH. One feels that the author regards the pendulation theory as a panacea, and that he selects for consideration those facts of distribution which fit it best. Certainly the problems of migration are vastly more than the symmetrical movement of organisms from a center under the control of the direction of pendulation. And the idea of pendulation itself seems more like an iridescent fancy than a reality. Biologists may well wait until there is some astronomic or geologic basis for such a hypothesis before they attempt to readjust their facts to the new theory.—H. C. COWLES.

MINOR NOTICES

Purple bacteria.—A monograph on Rhodobacteria[3] is the natural outcome of the results of shorter studies on the subject which have been presented from time to time by MOLISCH. After a discussion, partly historical, of methods of culture, the author describes eleven new species recognized by him and gives a classification, based upon those of WINOGRADSKY and MIGULA, in which he divides the order Rhodobacteria, containing all known purple bacteria, into two families: those which do and those which do not show sulphur granules in the cell substance. Turning to the biochemical side of the study, MOLISCH examines the relation of

[3] MOLISCH, HANS, Die Purpurbacterien nach neuen Untersuchungen. pp. 95. *pls.* 4. Jena: G. Fischer. 1907.

these organisms to light, oxygen, and organic substances. With regard to light, the purple bacteria do not ordinarily show positive phototaxis, but are incited to motility which continues for some time after the light is removed. They are not able to obtain carbon from carbon dioxid in the presence of light. Some forms are even anaerobic, and, unlike most pigment bacteria, can produce pigment under this condition. As to the pigment itself, MOLISCH distinguishes two kinds: the red (*bacteriopurpurin*) and a green (*bacteriochlorin*). The latter is distinct from cholorophyll, which fact agrees with that of their inability to use CO_2. MOLISCH concludes that nutrition from organic substance is somewhat related to light and the presence of pigment as shown by the increased energy caused by light; and that thus these forms stand between the colorless bacteria and the green algae.—MARY HEFFERAN.

The typhoid-coli group of bacilli.—Numerous methods have been proposed for the ready separation and identification of the typhoid and the colon bacilli in water. Such special media as LÖFFLER'S malachite-green, MACCONKEY'S lactose-bile, ENDO'S lactose-fuchsin, and CONRADI-DRIGALSKY'S crystal-violet, have been more or less successful in the hands of various workers. These are based upon substances which restrain the growth of one type of organism while allowing a characteristic development of the other. DUCAMP[4] proposes for this purpose the use of an "antibacilliary" broth prepared by cultivating in a lactose-peptone solution several strains of *B. coli*, for example, derived from different sources. This broth, when finally filtered germ-free, will be exhausted as a medium for *B. coli*, but will still allow the growth of *B. typhosus*. For the rapid detection of the latter in water, the sample is first plated in phenol broth and inoculations made from the colonies into lactose broth. If a race thus obtained grows in the anticoli and not in the antityphoid broth, and is agglutinated 1:50 by typhoid serum, it is undoubtedly *B. typhosus*.

Studies on the fermentative activities of the typhoid-coli-dysentery group resulted in the confirmation of some facts already known, and brought out some new affinities. *B. para-typhosus*, *B. enteritidis*, *B. psittacosis* Danysz and Thomassen, and hog cholera ferment the same sugars except for two races of hog cholera, which are inactive on xylose, dulcite, and mannose. *B. para-typhosus* Kurth in addition ferments saccharose and raffinose. *B. para-typhosus* A differs with respect to xylose, mannose, and dulcite.—MARY HEFFERAN.

NOTES FOR STUDENTS

Subterranean fungi.—ED. FISCHER has recently made a contribution[5] to the morphology of the fungi. The paper is based on the study of material collected

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4 DUCAMP, LOUIS, Contribution à l'étude de la différentiation du colibacille et du bacille typhique. Action des bacilles du groupe coli-typho-dyssentérique sur les hydrates de carbone. pp. 181. *pl. 1.* Thesis. Lille. 1907.

5 FISCHER, ED., Zur Morphologie der Hypogaeen. Bot. Zeit. **66**:141–168. *pl. 6.* 1908.